

a reaction chamber of a plasma generating device, the system of etching agents including one or more fluorine-containing compounds, chlorine and an optional inert carrier gas.

As discussed in the background of U.S. Patent No. 5,443,941 ("Bariya" newly cited and applied in paragraph 3 of the Official Action of July 13, 2000) various materials have been employed for use as anti-reflective coatings. These materials can be broadly classified as either organic materials or inorganic materials (See Column 2, Lines 3-6 of Bariya). In the etching art, different etch compositions or chemistries are used for organic and inorganic ARC materials. U.S. Patent No. 4,910,122 ("Arnold", cited in the Official Action of April 21, 1999) and U.S. Patent No. 5,753,418 ("Tsai", newly cited in paragraph 2 of the Official Action of July 13, 2000), for example, disclose etching organic ARC layers with an oxygen plasma (See examples 1 and 2 of Arnold) and a CF₄/Ar mixture (See Column 6, Lines 46-54 of Tsai). Abraham, on the other hand, discloses etching an inorganic ARC with Cl₂ or a chlorine compound as the reactive etching agent (See Column 6, Lines 33-43 of Abraham). Accordingly, the etchant chemistry is chosen based on the nature of the materials being etched in order to attain the desired etch rate selectivity. Thus, the forgoing documents establish that an etch chemistry intended for use with an inorganic ARC would not be expected to be suitable for an organic ARC.

Claims 1 - 4, 6 - 12, 17, 18 and 20 - 22 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Abraham (U.S. Patent No. 5,883,007) in view of Tsai (U.S. Patent No. 5,753,418). The reasons for the rejection are set forth in paragraph 2, on pages 2-3 of the Official Action. In the rejection, the Examiner proposes to modify

Abraham by (1) substituting the organic ARC of Tsai for Abraham's inorganic Ti based ARC and (2) using Abraham's etching gas chemistry for the Ti based inorganic ARC to etch the substituted organic ARC. This rejection is respectfully traversed for the following reasons.

Criteria for Prima Facie Case of Obviousness

To establish a prima facie case of obviousness, three basic criteria must be met:

1. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.
2. There must be a reasonable expectation of success.
3. The prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). As explained below, one of ordinary skill in the art would not have been motivated to make the combination proposed by the Examiner and there would have been no reasonable expectation of success. That is, the proposed substitution of the organic ARC of Tsai for the Ti based inorganic ARC of Abraham would render Abraham's invention unsatisfactory for its intended purpose and would change the principle of operation of Abraham. Moreover, the substitution proposed by the Examiner, could not have been made with any reasonable expectation of success.

Lack of Motivation Based on Modification Rendering Abraham
Unsatisfactory for Intended Purpose

The rejection is improper because the modification of Abraham proposed by the Examiner renders the invention of Abraham unsatisfactory for its intended purpose. That is, if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). See MPEP 2143.01.

In the present case, Abraham discloses the use of a specific combination of etching agents for use with a TiN ARC to achieve desired selectivity with respect to an overlying photoresist and an underlying aluminum layer. Abraham's invention was intended to overcome deficiencies of prior etching techniques of etching TiN ARC layer materials (See Column 7, Lines 47-64 of Abraham). Substitution of an organic ARC layer for the inorganic Ti based ARC layer of Abraham would defeat Abraham's intended purpose of providing an etchant chemistry with a high TiN ARC layer to photoresist etch rate selectivity. As such, the rejection is improper and should be withdrawn.

Lack of Motivation Based on Change of Principle of Abraham's Invention

The rejection is also improper because the modification of Abraham proposed by the Examiner changes the principle of operation of the invention of Abraham. That is, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are

not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). See MPEP 2143.01. Abraham discloses the use of a specific combination of etching agents for etching Ti based inorganic anti-reflective coating layers. As explained above, Abraham's invention sought to improve etch rate selectivity of the TiN ARC to the overlying photoresist and underlying aluminum layer. An organic ARC is a polymer based composition and thus approaches the chemistry of Abraham's photoresist. The rejection is improper because substitution of an organic ARC layer for the inorganic Ti based ARC layer of Abraham would change the principle of operation of Abraham's invention.

Lack of Reasonable Expectation of Success

The etch chemistry employed by Abraham is specifically chosen based on its ability to selectively etch a Ti based inorganic ARC material vis-a-vis an overlying photoresist and underlying aluminum layer. Abraham, for example, discloses the etch chemistry's "exceptional ability to etch TiN ARC layer materials" (See Column 7, Lines 49-50 of Abraham). Abraham further discloses that the etchant achieves a desired etch rate selectivity of a TiN ARC to photoresist and TiN ARC to an underlying aluminum layer (See Column 7, Lines 46-51, Column 8, Lines 43-44 and 50-64 of Abraham). Accordingly, Abraham is directed to the problem of selectively etching Ti based inorganic ARC materials and a person of ordinary skill in the art would not have expected Abraham's etchant gas chemistry to be suitable for achieving a desired selectivity of an organic ARC. As pointed out earlier, the prior art establishes that organic and inorganic ARC materials

are etched with completely different etchant gases. The Examiner has not identified any prior art reference establishing a reasonable expectation that an organic ARC can be successfully etched with an etchant gas suitable for an inorganic ARC. As such, the Official Action fails to establish the required reasonable expectation of success for the proposed combination of Abraham and Tsai.

Tsai discloses using a different etch chemistry than that employed by Abraham. Tsai, for example, discloses an etchant gas composition comprising carbon tetrafluoride and argon for etching the organic ARC (Column 6, Lines 52-54 of Tsai). There is no suggestion or teaching in Tsai that the etchant chemistry of Abraham could be used with the organic ARC of Tsai. Although it would not have been obvious to substitute Tsai's organic ARC for the TiN ARC of Abraham, such a substitution would have necessitated substituting Tsai's etchant gas for Abraham's etchant gas, thus teaching away from the claimed process. Since the reasonable expectation of success must be found in the prior art and not in the Applicant's disclosure, there is no reasonable expectation of success and the Examiner has therefore failed to establish a *prima facie* case of obviousness.

In view of the foregoing, it is submitted that the combination of Abraham and Tsai fails to suggest the claimed process.

Claims 16 and 19 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Abraham in view of Tsai and further in view of Bariya. The reasons for the rejection are set forth in paragraph 3, on pages 3- 4 of the Official Action.

As set forth in the Official Action, Bariya is relied upon merely for its background mention of polyimide as an organic ARC. Bariya, however, fails to cure the aforementioned deficiencies of Abraham and Tsai since the combination thereof fails to disclose the claimed process comprising exposing the exposed areas of an ARC to an oxygen-free system of etching agents in an ionized state in a reaction chamber of a plasma generating device, the system of etching agents including one or more fluorine-containing compounds, chlorine and an optional inert carrier gas. Accordingly, withdrawal of this ground of rejection is respectfully traversed.

Claims 5 and 13 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Abraham in view of Tsai and further in view of the assertion that "one skilled in the art would have found it obvious to employ any of a variety of gas flow rates including those claimed by the applicant because etchant flow rate is a well known variable in the plasma etching art which is known to effect the plasma etching process" and that "the selection of particular flow rates would simply involve routine experimentation". The reasons for the rejection are set forth in paragraph 4, on page 4 of the Official Action. The rejection is traversed for the following reasons.

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). The

mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.

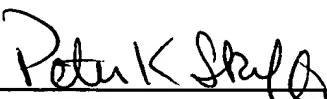
In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). See MPEP 2143.01. As explained above, it would not have been obvious to substitute an organic ARC for Abraham's inorganic ARC. However, if Abraham's ARC was replaced with Tsai's organic ARC, one of ordinary skill would have also replaced Abraham's etchant gas with Tsai's etchant gas in which case (1) Tsai's etchant gas would not suggest the etchant gas used in the claimed process and (2) optimization of the flow rates thereof would not suggest the features of Claims 5 and 13. Accordingly, withdrawal of this ground of rejection is respectfully requested.

Applicants submit that the differences between the claimed subject matter and the prior art are such that the claimed subject matter, as a whole, would not have been obvious at the time the invention was made to a person having ordinary skill in the art.

In view of the foregoing, Applicants submit that the present application is in condition for allowance and such action is earnestly solicited.

Respectfully submitted,
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